

Flood-Tolerant Soybeans

Trials Focus On Finding Soybean Lines Tolerant To Flooding

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Flood tolerance in soybeans was a topic discussed recently by Scotty Smothers, research specialist from the University of Missouri Delta Center.

"There's really no lines out there that have tolerance," he said. "In earlier trials one line, Pioneer 94B73, performed the best, but it still

"We divide the seed we receive into maturity groups and then plant the seed in hills. At flowering we flood them until visible signs of damage is observed. Then we drain them, let them recover for two weeks and we rate them. At harvest the plots are weighed and compared to a non-flood control to determine yield loss.

"What we found is some soybean cultivars do differ in the severity of damage to flooding. The lines with the most tolerance are showing up to a 40 percent yield loss. The less tolerant lines

Scotty Smothers shows some soybean lines that have been crossed with flood tolerant PIs. These PIs have been subjected to the same treatment as the dead soybeans, a five-day flood at flowering.

Photo by John LaRose, Jr.



showed up to a 40 percent yield loss under flooding conditions. In 2009 testing, we found other private variety lines that performed as well or better than 94B73 under flooding conditions."

One early visible side effect of flooding is plant yellowing. The water takes all the air out of the

show an 80 percent loss or more. Some soybean PIs are likely to have flood tolerant genes. Many of the PIs we're getting are coming from Asian countries such as Korea, Japan, or China – places that grow a lot of rice. Saturated soils are common in these areas and it's possible that many of these PIs have natural flood tol-

In the chart below, ratings are from 1-5 with 1 being no damage and 5 being dead. Ratings in red are means across two replications and those with an * are ratings from last year for that variety. These are just varieties that Smothers has screened that show less damage due to flooding. Yield loss could still be near 30 percent or even possibly greater under heavy flooding. On the other hand, those that are less tolerant could see up to 100 percent loss. "We haven't found anything aside from experimental crosses with PI's that we would classify as tolerant," Smothers said.

3	III	4-53-5	3	Hombeck HBK R3927	Flood09	3.7	
10	IV	4-51-4	6	Mersch, Miami 949LL	Flood09	3.3	
15	V	4-51-4	11	Hombeck HBK C5029	Flood09	3.3	
16	I	4-51-4	12	Hombeck HBK C5528	Flood09	2.3	
17	IV	4-51-4	13	Hombeck HALO 4:65	Flood09	3.7	
31	IV	4-51-4	27	S05 11268	Flood09	2.7	
32	IV	4-51-4	28	S05-11482	Flood09	2.7	
48	IV	4-53-4	14	Pioneer S4Y01	Flood09	3.7	
49	IV	4-53-4	15	Pioneer S4Y80	Flood09	2.5	
50	IV	4-53-4	16	Pioneer S4Y91	Flood09	3.7	
53	IV	4-53-4	19	Pioneer REV RV49R20	Flood09	3.5	
54	IV	4-53-4	20	Pioneer REV RV49R21	Flood09	3.7	
97	IV	4-53-4	63	Delta King DKX 0461	Flood09	3.7	RR2
98	IV	4-53-4	64	Delta King DKX 0482	Flood09	3.5	RR2
142	IV	4-53-4	108	Progeny P4908RR	Flood09	4.3	*(2.8)
149	V	4-53-5	2	Morsoy RT 5388N	Flood09	2.7	*(3.3)
155	V	4-53-5	8	Pioneer S5Y20	Flood09	3.0	
158	V	4-53-5	9	Pioneer S5Y40	Flood09	2.7	*(3.5)
159	V	4-53-5	11	Asgrow AG5606	Flood09	3.0	
163	V	4-53-5	18	Schillinger 5440.R	Flood09	3.3	
166	V	4-53-5	19	Dyna-Gro 32A53	Flood09	3.7	*(3.0)
168	V	4-53-5	21	Dyna-Gro 33C59	Flood09	3.7	*(3.0)
172	V	4-53-5	25	Terral TV54R28	Flood09	3.0	*(3.3)
177	V	4-53-5	30	Hombeck HBK R5226	Flood09	3.7	*(3.5)
181	V	4-53-5	34	Delta Gro 5160RR/STS	Flood09	3.7	*(3.0)
185	V	4-53-5	38	MPG 5505nRR/STS	Flood09	2.7	
188	V	4-53-5	41	USG 7515NRS	Flood09	3.3	*(3.5)
189	V	4-53-5	42	USG 75Z38	Flood09	4.0	*(2.5)
197	V	4-53-5	50	Progeny P5650RR	Flood09	3.0	*(3.5)
198	V	4-53-5	51	Progeny P5218RR	Flood09	4.0	*(3.3)
200	V	4-53-5	53	Progeny P5319RR	Flood09	2.7	
201	V	4-53-5	51	Progeny P5109RR	Flood09	3.3	

soil and reduces the ability of the plant to fix nitrogen, causing stunted growth, leaf defoliation and ultimately plant death.

The method of flooding is total saturation of the soil. Usually with two, or two-and-one-half inches of water on the plants for five or six days, the plant yellowing begins to appear on known susceptible lines. Smothers discussed Group III, IV and V lines.

"We start flooding them at the flowering stage," he said. "If we do it before then, the plants recover and yield loss is less noticeable. But if it's done right at flowering we can tell if there's yield loss or if there's some tolerance. We're also trying to identify Group III, IV and V plant introductions that have some tolerance, and there's a few out there. We plan to cross the PIs with the lines that we have and see if we can get something that provides less than 10 percent yield loss."

The trial has been underway for nine years now, and all of the varieties come from the University of Missouri state variety test. Over 300 varieties from private industry are entered into the state variety test annually. Most of these varieties are also sent to Smothers for flood tolerance evaluation.

erance or have adapted to survive in saturated soil conditions. Smothers showed a PI from Korea that has some resistance to flooding. He said there are plans to cross this line with soybean varieties that have other desirable characteristics such as high yield and disease resistance and evaluate inherited flood tolerance.

In closing, he said no lines have yet been found that are 100 percent tolerant to flooding.

"The best case scenario you're still looking at 30-40 percent yield loss under heavy flooding conditions," he said. "Of course, in flood prone areas we always recommend planting on beds. This helps get the plant up out of the soil a little. Also, good drainage is imperative in heavy soils or low lying areas. Anything to get the beans out of the water really helps, but mainly we haven't found anything that is 100 percent flood tolerant. We do have the hope of crossing PIs with current varieties to get some kind of line out there that is more tolerant." Δ

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